

work of his later years—rabies and its prevention. His researches on vinegar, on the diseases of wine, his laborious investigations extending over years which succeeded in disclosing the origin of the diseases in silkworms which had threatened to ruin the silk industry of France, his studies on beer, collected in a magnificent volume covering nearly 400 octavo pages, are but a few of the colossal labours which occupied his mind before he became absorbed in the study of contagious diseases.

At the ripe age of fifty-five we find him devoting himself with all the energy and enthusiasm of youth to the study of pathological phenomena. Various theories as to the origin of anthrax were in the air at the time when Pasteur determined to enter the field. M. Radot gives a most vivid account of these researches and of the hopes and anxieties to which Pasteur was a prey at this time, living as he did in a condition of intense nervous tension and excitement during their progress. Difficulties, however, never deterred, they only served to stimulate, Pasteur. The memoir in which Pasteur and his assistants communicated their successful investigations on anthrax and septicæmia to the Academy of Sciences is famous, not only on account of the manner in which they mastered the etiology of these diseases, but also for the extreme fertility and originality of the ideas and experiments which it records. Having established the identity of the virus he set to work to discover a means of combating its action, and thus he was led to those epoch-making researches in the domain of immunity which were to succeed in converting a virus into a vaccine—a malignant foe into a beneficent friend—and which have made the name of Pasteur a household word revered in the remotest corners of the globe.

M. Radot, besides giving us a faithful and fascinating history of Pasteur's scientific life and aspirations, has with the delicate touch of a master revealed the inner life of this great genius, with rare subtlety indicating the essential character of the man who,

"absorbed as he was in his daily task, yet carried within himself a constant aspiration towards the ideal, a deep conviction of the reality of the infinite and a trustful acquiescence in the mystery of the universe."

No one who reads Pasteur's speeches can fail to be struck by the lofty tone which pervades them; he sought always the highest and scorned to touch what was base; his deep religious sense communicated itself to all who were brought in contact with him, from the most exalted in the land to the poorest student who came to work under his guidance.

In one of those public utterances which in his declining years became so rare and so eagerly sought for he tells us:

"Our only consolation, as we feel our own strength failing us, is the consciousness that we may help those who come after us to do more and to do better than ourselves, fixing their eyes as they can on the great horizons of which we only had a glimpse."

This is the keynote to his life, embodying the same passionate desire to help others which stimulated him from his earliest years, but mellowed by the ripeness of advancing age, and the consciousness of a life fast drawing to a close, the burden of which was soon to be laid aside.

G. C. FRANKLAND.

A MANUAL OF MEDICINE.

A Manual of Medicine. Edited by W. H. Allchin, M.D., F.R.C.P. Lond., F.R.S. Edin., Senior Physician and Lecturer on Clinical Medicine, Westminster Hospital. Vol. iii. *Diseases of the Nervous System.* Pp. x + 417. (London: Macmillan and Co., Ltd., 1901.) Price 7s. 6d. net.

THE third volume of Dr. Allchin's "Manual of Medicine" is well up to the standard of its predecessors, in fact, if anything, may be regarded as rather exceeding it. Here, in 417 short pages, the student of medicine has at his command a complete and up-to-date book upon that ever-increasing domain of medicine, nervous disease. The difficulty of editing must in this volume almost have reached its maximum. When we come to consider the enormous mass of literature which has accumulated since even the publication of the last standard book upon this subject, we may perhaps appreciate the great difficulty of compressing our compendious knowledge upon nervous disease into what may, without forcing language, be called a manual. In these circumstances we can hardly expect theories to be discussed *in extenso*, or ample polemic justice to be done to controversial matter. The book is filled with terse fact, and if its readability suffers somewhat on this account, its value to the student is proportionally increased.

With the space at our command we must content ourselves with indicating rather than describing the contents of the book. Even to those out of touch with the burning problems of nervous disease, and only generally interested with the physiology of the nervous system as a part of biology, it will be manifest that the recent progress in histological method, the product of increased knowledge of bio-chemistry, has profoundly modified our conceptions of the constitution of the nervous system and also neuro-pathology.

In an introductory chapter Prof. Sherrington deals with the physiology of the nervous system in a most lucid and wonderfully succinct manner. This chapter is followed by one contributed by Dr. Aldren Turner upon the general pathology of the nervous system. Dr. Turner points out that the adoption of the conception that the nervous system consists of a series of neurons necessarily precludes us from continuing to divide affections of the nervous system above the foramen magnum from those below. The only true system of classification must be one based upon the neuron systems primarily involved. It must, however, be admitted that a given morbid process need not necessarily confine itself to one neuron system, but may simultaneously implicate two or more. Several other articles are contributed by the same author. The one on focal diagnosis is especially to be recommended.

With the beer-poisoning epidemic fresh in our memory we naturally turn to the article on peripheral neuritis, which is written by Dr. Purves Stewart. The different varieties of neuritis are well described, the author wisely abstaining from controversial matter. Dr. Ormerod contributes articles upon the spinal cord and its membranes and the muscular dystrophies.

The volume concludes with a most instructive and

beautifully illustrated article on medical ophthalmology, by Dr. James Taylor, and one on the medical applications of Electricity, by Dr. Bertram Abrahams.

Dr. Allchin's third volume is, in our opinion, highly to be recommended. We know of no book in the language upon this subject which will be more worth the student's, and indeed the practitioner's, while to read and to possess.

F. W. T.

PRACTICAL MATHEMATICS.

Practical Mathematics for Beginners. By Frank Castle, M.I.M.E. Pp. ix + 313. (London: Macmillan and Co., Ltd., 1901.) Price 2s. 6d.

THIS little book deserves the title of Practical Mathematics better than any work that we have seen. The subjects dealt with are arithmetic, plane geometry, algebra, mensuration and analytic geometry. The chapters on arithmetic deal with those operations in which this subject is most nearly related to algebra—such as the theory of fractions, ratio and the extraction of the square root. The part on geometry is strictly limited to constructions with rule, compass, &c., and explains the use of simple and diagonal scales; it is in no sense a course of deductive geometry such as we have in the books of Euclid. The part of the book dealing with algebra is more extensive, but still very elementary; it does not, for example, include a discussion of quadratic equations, although it shows how a quadratic expression in x can, in very simple cases, be resolved into factors. While noticing this part of the book we may point out some corrections which should be made in the next edition. Thus, in p. 76, where it is proposed to resolve $x^2 - 9x + 20$ into factors, we find the statement, "Hence $x = 4$, or $x - 4 = 0$ is a factor." The beginner should be put on his guard against such a loose mode of expression. In the next example on the same page we find, "Next put $x = + 5$, and it is found to be a factor." The factor referred to is $x - 5$. In p. 77 we have the incorrect expression, "When required to add, subtract or compare fractional expressions, it is necessary that they shall all have a common denominator." In p. 88, g is described as $32'2$ "feet per second" instead of $32'2$ "feet per second per second," which the majority of mathematicians have at last been forced to acknowledge as the only correct mode of speaking.

These, however, are minor blemishes which are very easily removed.

It is a cardinal aim with the author to make all his examples illustrative of questions relating to various branches of physics, and for a certain class of students (those who have already come into contact with such practical matters) this is a very good plan, because it enlists the interest of the learner in convincing him that he is applying his mathematics to something real. It is doubtful if the plan has as much value for the ordinary schoolboy who is, under our precious system of education, a complete stranger to everything in the domain of physics. Hence such questions as that in example 5, p. 88, relating to the arrangement of a number of Grove's cells, will not convey much meaning to any but students of physics. There are useful little chapters on logarithms,

showing their use and illustrating several things in which beginners are very apt to make mistakes. After this we come to an explanation of the slide rule and its applications; and the remainder of the book is that which most entitles it to the name of Practical Mathematics, this portion being of value to the student who wishes to be able to apply his pure mathematics to the representation of physical results. Here there is a great deal of graphic work done by means of squared paper, and a considerable portion of the analytic geometry of right lines, circles and higher curves is expounded, the accompanying illustrations being all drawn from physics. The fundamental notions of the differential calculus are very well and simply explained by this same system of plotting on squared paper; and the ease with which the processes can be followed and understood even by beginners who have nothing but a knowledge of arithmetic and elementary algebra to go upon shows that, in our ordinary course of mathematical teaching, the differential calculus is very unnecessarily postponed—that, in other words, our mathematical course for beginners should be made eclectic in character, a portion of any subject being introduced when the mind of the student is in a state to understand it. Our present system is essentially different; we feel constrained to finish each subject before beginning another, although the finish of one subject may be much more difficult than the preliminary portion of that which is postponed; and we thus lose sight of the fact that our present divisions of mathematics are only artificial, and that mathematics is, in reality, one connected whole.

In the part of the work dealing with mensuration two planimeters are described—the Hatchet and Amsler's.

The work gives an excellent epitome of the various branches of mathematics dealt with, and it will serve as a store of very good exercises in elementary methods for all students who desire to make a practical use of their mathematical knowledge in picturing the relations between various physical quantities.

OUR BOOK SHELF.

Memorial Lectures delivered before the Chemical Society, 1893-1900. Pp. 560. With fourteen portraits. (London: Gurney and Jackson, 1901.) Price 7s. 6d.

THE Chemical Society has done an important service to chemists and to students of chemistry by collecting these memorial lectures into one volume, and issuing it under conditions which render it accessible to readers of whom some may not be Fellows of the Society and consequently have not enjoyed the advantage of hearing the lectures when delivered or of reading them in the pages of the *Transactions*.

The lives of the men whose work and achievements are commemorated in this volume link us with the now long-distant past, and remind us of the immense strides which have been made in consequence of their discoveries and the discoveries of their contemporaries since the days when Berzelius and, later, Liebig were the dominant authorities. They remind us of the great and almost sudden advance which was accomplished between 1850 and 1865, when the modern system of atomic weights, definite ideas of valency and constitutional formulæ were finally established. The student who aspires to understand by what methods and with what laborious effort the greatest degree of scientific accuracy is alone attainable must read about the work of Stas on atomic